REMARKS

Claims 1, 5, 31, 34, 37-38, 40-47, 49 and 53 are all the claims presently pending in the present Application. Claims 1, 5, 31, 34, 37, 41-47, 49 and 53 have been amended to more particularly define the claimed invention. Claims 4, 8, 35, 48, 50-52 and 55-56 have been canceled.

It is noted that the amendments are made only to more particularly define the invention and not for distinguishing the invention over the prior art, for narrowing the scope of the claims, or for any reason related to a statutory requirement for patentability. It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 1, 5, 31, 34, 37-38, 40-47, 49 and 53 stand rejected under 35 U.S.C. §103 (a) as being unpatentable over Yau et al. (US Patent No. 6,054,379) in view of Allada et al. (6,218,317 B1) and further in view of the Alleged Admitted Prior Art (AAPA).

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

The claimed invention (e.g., as recited, for example, in claim 1 and similarly recited in claims 5, 41-42 and 49) is directed to a semiconductor device, including a multi-layered insulation film formed on a semiconductor substrate, the multi-layered insulation film including a methyl silsequioxane (MSQ) layer, **a methylated hydrogen silsesquioxane (MHSQ) layer formed on and being in contact with the MSQ layer**, and an inorganic insulation layer formed on the MSHQ layer and including a member selected from the group consisting of silicon oxide, silicon nitride and silicon oxynitride. The device also includes a plurality of wires which are formed in grooves formed in the multi-layered insulation film, the MSQ layer, MHSQ layer and inorganic insulation layer of the multi-layered insulation film filling a space between the wires.

Conventionally insulating layers may include an inorganic insulating layer (e.g., a silicon oxide layer) on an organic insulating layer. However, in devices formed by such conventional methods, during a subsequent planarizing step, peeling occurs at the interface between the organic and inorganic insulating layers, which can result in cross-talk between wires (e.g., wires

which are separated by the insulating layers) in the semiconductor device (Application at Figure 5; page 2, lines 12-27; page 6, line 13 - Page 7, line 8). Other conventional insulating layers include BPSG (Application at Figure 9(b)), but BPSG has a poor gap-filling characteristic.

An exemplary aspect of the claimed invention, on the other hand, includes a methyl silsequioxane (MSQ) layer, **a methylated hydrogen silsesquioxane (MHSQ) layer formed on and being in contact with the MSQ layer**, and an inorganic insulation layer formed on the MSHQ layer and including a member selected from the group consisting of silicon oxide, silicon nitride and silicon oxynitride. (Application at page 21, line 22-page 23, line 15; Figure 1).

The MHSQ layer of the multi-layered insulation film may help to improve adhesion between the MSQ layer and the inorganic insulation layer. (Application at page 25, lines 21-26).

II. ALLEGED PRIOR ART REFERENCES

The Examiner alleges that Yau would have been combined with Allada and the AAPA to form the invention of claims 1, 5, 31, 34, 37-38, 40-47, 49 and 53. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

In contrast to Yau which is directed to a method of depositing an oxidized organo silane film, Allada is intended to address the problems involved with forming an undoped silicon glass (USG) hardmask on a polymer-insulated material without taking out a wafer from a spin-truck device, by producing multilayered wires in which both the hardmask and a layered insulation material are capable of being spin-coated. Further, in complete contrast to Yau and Allada, the AAPA simply teaches forming a silicon oxide film on a methyl silsesquioxane (MSQ) film 2 (Application at page 1, lines 16-21).

Thus, clearly Yau, Allada, and the AAPA have different problems and objects to be solved, and there clearly is no motivation to combine Yau, Allada, and the AAPA as alleged by the Examiner. In short, Applicant respectfully submits that these references are unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

In fact, Applicant submits that the references provide no motivation or suggestion to urge

the combination as alleged by the Examiner. Indeed, these references clearly do not teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, neither Yau, nor Allada, nor the AAPA, nor any alleged combination thereof teaches or suggests "*a multi-layered insulation film formed on a semiconductor substrate, said multi-layered insulation film comprising: a methyl silsequioxane (MSQ) layer; a methylated hydrogen silsesquioxane (MHSQ) layer formed on and being in contact with said MSQ layer; and an inorganic insulation layer formed on and being in contact with said MSHQ layer and comprising a member selected from the group consisting of silicon oxide, silicon nitride and silicon oxynitride*", as recited in claim 1 and similarly recited in claims 5, 41, 42 and 49 (Application at page 16, lines 8-21; Figure 3(b)).

As noted above, the MHSQ layer of the multi-layered insulation film may help to improve adhesion **between the MSQ layer and the inorganic insulation layer** (Application at page 25, lines 21-26).

Clearly, these features are not taught or suggested by the cited references.

As a preliminary matter, Applicant notes that the Examiner attempts to equate the "interconnect lines 724" in the Yau reference (US 6,054,379) with the "wires" of the claimed invention. This is completely unreasonable.

In fact, in the structure of the Yau reference, five layers (710, 714, 716, 718, 722) fill a space between the interconnect lines 724. In contrast, in the claimed invention, three layers (e.g., MSQ layer, MHSQ layer and the inorganic insulation layer in claims 1, 5, 41 and 42) or one layer (e.g., the MSQ layer in claim 49) fill a space between the wires or the gate electrodes. Therefore, contrary to the Examiner's allegations, the layers and wires (or gate electrodes) of the claimed invention are very different from the features of the Yau reference.

An important object of the claimed invention is to solve a problem caused by forming an insulation layer (e.g., an MSQ layer) in a space between wires (or gate electrodes). Although it is necessary that the insulation layer is coated with an inorganic layer, the

inorganic layer easily peels off the insulation layer (e.g., see Application at page 2, line 12 to the bottom line on page 2, and at page 5, line 9 to page 6, line 13). The claimed invention solves this problem by forming an MHSQ layer (e.g., a second insulation layer) between the insulation layer (e.g., the MSQ layer) and the inorganic insulation layer (e.g., in order to improve adhesion therebetween).

In contrast, the Yau reference and the Allada reference (US 6,218,317) are not intended to solve a problem caused by forming an insulation layer (e.g., an MSQ layer) in a space between wires (or gate electrodes). Indeed, Yau and Allada have completely different problems and objects to be solved than the claimed invention.

Indeed, neither Yau, nor Allada teach or suggest an MHSQ layer formed on and being in contact with an MSQ layer (e.g., to improve adhesion between the MSQ layer and an inorganic insulation layer). Therefore, the configuration of layers and wires (or gate electrodes) in the claimed invention cannot easily be achieved by a person skilled in the art based on the cited references and the prior art disclosed in the present application.

In addition, the Yau-reference discloses parylene, FSG and silicon oxide as an initial first intermetal dielectric layer 710 (column 13, lines 12-13). The Examiner surprisingly attempts to equate the MSQ layer in the claimed invention (e.g., a first insulation layer) to the initial first intermetal dielectric layer 710. However, this is clearly unreasonable. Indeed, nowhere does the Yau-reference teach or suggest an MSQ layer (e.g., a first insulation layer) as in the claimed invention. In fact, Parylene is an organic material that does not contain silicon (Si), and FSG is a fluorine-containing silicon oxide. Parylene, and FSG are completely different material from MSQ.

Further, the Yau-reference only shows "oxidized organo silane layer" as an adhesive layer. That is, the Yau-reference does not teach or suggest that the "oxidized organo silane layer" is an MHSQ layer (e.g., a second insulation layer) as in the claimed invention.

Further, the Allada-reference only shows use of methylated oxide-type materials such as HOSP in place of USG (undoped silicon glass) as hard masks. The Allada-reference does not teach or suggest the multilayer structure (e.g., stacked insulation layers) and wires (or gate electrodes) as in the claimed invention.

Again, as noted above, like Yau, Allada does not teach or suggest an MHSQ layer formed on and being in contact with an MSQ layer (e.g., to improve adhesion between the MSQ layer and an inorganic insulation layer). Thus, Allada certainly does not make up for the deficiencies in Yau.

Further, Applicant would again submit that the AAPA does not teach or suggest these features of the claimed invention. Indeed, the Examiner again surprisingly attempts to rely on Figures 8-9 and page 4, line 1-page 6, line 13 of the present Application to support his arguments. However, the Examiner is clearly incorrect.

Indeed, Applicannt would again point out that Figures 8-9 of the present Application simply depict a conventional device including an insulation layer 55 which is formed of BPSG. Nowhere in Figures 8 and 9 or anywhere else, does the AAPA teach or suggest an MHSQ layer formed on and being in contact with an MSQ layer (e.g., to improve adhesion between the MSQ layer and an inorganic insulation layer), as in the claimed invention (Application at page 21, line 22-page 23, line 15; Figure 1).

Therefore, neither Allada nor the AAPA make up for the deficiencies in Yau.

Therefore, Applicant respectfully submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, the Examiner is respectfully requested to withdraw these objections.

In view of the foregoing, Applicant submits that claims 1, 5, 31, 34, 37-38, 40-47, 49 and 53, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to

discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully submitted,

Date: 1/30/08

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CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that the foregoing was filed by facsimile with the United States Patent and Trademark Office, Examiner Julio Maldonado, Group Art Unit #2823 at fax number 571-273-8300 this 30th day of January, 2008.

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